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# Use of video games to increase sport knowledge and game-play performance

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**Use of video games to increase sport knowledge and game-play performance**

by

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A thesis submitted to the graduate faculty  
in partial fulfillment of the requirements for the degree of

**MASTER OF SCIENCE**

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## ABSTRACT

Twenty-seven novice football coaches 18-30 years in age were recruited to participate in this study. The study consisted of three parts: the pre-test, intervention, and post-test. A knowledge score, football experience, and XBOX 360 experience were all obtained at baseline (pre-test). Knowledge was then tested again at post-test to track changes over the intervention. An intervention consisting of six practice sessions took place over a 3-week period between the pre- and post-testing sessions. Each practice session consisted of a video game simulation of a football game and a football scenario response selection session where accuracy of decisions, speed of decisions, total yards, level of game-play, and win/loss ratio were recorded. These variables helped track changes from pre- to post-intervention. All participants finished the study in its entirety.

A dependent t-test showed that knowledge increased significantly from pre- to post-test [ $t(26) = -4.997, p = 0.0001$ ]. The improvements were moderate with an effect size of 0.57. A group comparison (high knowledge and low knowledge) based on post knowledge test scores produced significant within subject effects for speed of decisions, total yards and level of video game play, but yielded no within subject interactions or between subject (knowledge group) effects at a significant level. A second group comparison (low, moderate, and high experience) based on football experience level produced three significant time main effects for knowledge, speed, and total yards along with one interaction for accuracy. No between subject effects were significant, with accuracy being the only variable approaching significance. The results show video games to be an effective method to increase sport knowledge.



## INTRODUCTION

Knowledge is required for effective decision making and helps build a framework that can influence game performance (French & Thomas, 1987). While sport skill and knowledge both affect game performance, it is the knowledge component that changes rapidly during development and is attainable for most people. The knowledge component consists of both declarative and procedural knowledge. Both types of knowledge play a role in game performance. Declarative knowledge is factual information or what is known as basic sport knowledge such as terminology and rules. Procedural knowledge focuses on what to do and is expressed as an if-then statement for completing an appropriate action in the context of a game (McPherson & French, 1991).

Acquiring procedural knowledge can increase the correct response in game-play situations and can contribute to a higher level of success in game performance. These aspects of sport knowledge are obtained in the early years of participation (French et al. 1996), which explains why novice players often lack both declarative and procedural knowledge. The absence of declarative knowledge leads to the misunderstanding of rules or overall goals of games, while that of procedural knowledge would lead to inability to make good decisions in game-play (Bunker & Thorpe, 1982). In sport, skill and procedural knowledge limit game performance. Knowing what to do (procedural knowledge) has been shown to precede the ability to perform (motor or sport skill) (McPherson & Thomas, 1989). Therefore, increasing procedural knowledge has the potential to improve game play performance. The challenge is finding the method by which the increase in knowledge can be made, especially in view of the fact that coaches and teachers often possess limited procedural knowledge.

Video games are of particular interest, because research has shown them to be effective teaching tools (Swing & Anderson, 2008). Skills ranging from algebra to golfing have recorded success using video games as instruction tools (Buckley & Anderson, 2006). The effect is significant for varied audiences, including elementary schools and military personnel. Why have video games been an effective teaching tool? Answering this question can help identify potential advantages of using video games to obtain important knowledge. Among numerous benefits, video games capture and hold an individual's attention. This allows for a better identification of cues compared to those who do not play video games (Buckley & Anderson, 2006). Matching objectives and pace of the game to player abilities is another advantage associated with video games as a teaching tool.

The goal in defining expertise is to understand what distinguishes an outstanding individual in a domain from the less outstanding individual as well as individuals in general (O'sullivan & Douthett, 1994). Research has shown knowledge to be a distinguishing factor in the domain of sport expertise and game-play performance (French & Thomas, 1987; McPherson & Thomas, 1989; Starkes & Allard, 1993). Because sport knowledge (declarative and procedural) affects game performance, further research is needed to determine how procedural and declarative knowledge can be obtained. Acquiring knowledge from play and practice takes time and money due to physical fatigue, equipment accommodations, and other limiting factors. These barriers influence players and the amount of practice that can be obtained at any one time. Research shows that video games yield a positive outcome in obtaining knowledge (Swing & Anderson, 2008), and have fewer barriers such as fatigue. Considering the barriers to practice and research surrounding video

games as a teaching tool, video games can be seen as a practical tool used to increase sport knowledge. Game-play performance and expertise have been shown to be affected by knowledge level while video games have been shown to increase knowledge in other domains. In the light of these facts, video games can be an effective tool in increasing sport knowledge and in turn, expertise and game-play performance. The purpose of this study is to address the question whether video games can improve procedural sport knowledge. The hypotheses are as follows

Hypotheses 1: The video representation of real-life sport situations increases declarative and procedural knowledge as measured by a written knowledge test.

Hypothesis 2: Practice with the video game improves the accuracy and speed of decisions in game scenarios.

Hypothesis 3: All participants increase knowledge regardless of their initial experience with football. This includes the knowledge test, scenarios, and game play (win-loss, total offense, etc).

## **LITERATURE REVIEW**

### **Expertise**

The idea of expertise is an appealing topic in numerous domains, including sport. People's addiction to be the best or their continuing pursuit of superior performance levels contribute to this interest. As stated by Ericsson and Smith (1991, p. 2), research on expertise has attempted to "understand and account for what distinguishes outstanding individuals in a domain from less outstanding individuals in that domain as well as from people in general." Defining "expert" traits in certain conditions has been the first step in expertise research. The achievement and understanding of these distinguishing characteristics are highly sought after in sport. However, scholars want to facilitate the development and understanding of expertise in young athletes (Thomas & Thomas, 1994).

Within the realm of sport, the term "expert" is often relative. The definition of an expert can range from describing the best long jumper on a junior high track and field team to an Olympic champion in the decathlon. However, from a practical perspective, understanding how expertise occurs provides strategies for helping novices become more expert (Thomas & Thomas, 1994). Research also suggests that the path leading to expertise in sport is significantly influenced by the development of specific components, such as knowledge, skill, and game-performance.

High level of game performance is one way to define expertise. However, the literature provides evidence that levels of game play and sport performance are influenced by knowledge. A study of children's basketball performance in relation to knowledge development indicated that the development of sport knowledge plays a significant role in

skilled sport performance levels of children (French & Thomas, 1987). Decision making ability was the major determining factor in this study, showing that the change in a child's performance over the course of a season was due to an increase in their ability to make appropriate decisions during game play rather than an increase in motor skills. This suggests that cognitive skills in sport performance progress at a faster rate than that of motor skills. For example, the participant's execution component and scores for dribbling and shooting skills did not change over the season. Game play performance increased over the course of a season as did decision making, while skill did not. These findings suggest that the development of the sport knowledge base can influence actual game play without attainment of high levels of skill (French & Thomas, 1987).

Several authors have emphasized the role of prerequisite knowledge as a foundation for learning more complex skills (Bransford et al. 1979). Other studies produced evidence that part of the reason why high caliber athletes excel is due to the significant stores of knowledge about their sport structures (Chamberlain & Coelho, 1993). Current frameworks can be utilized to better define knowledge and the influence it has on performance. Both skill and knowledge are limiting factors to achieving expertise in sport performance, but it is knowledge that precedes skill in performance.

In other words, "knowing precedes doing or the ability to do." Thomas and Thomas (1994, p. 296) stated that, "It is possible to know when and how to do a movement, yet not be able to actually execute the movement." This may be due to the fact that the knowledge component of a domain is obtainable for most people and acquired more quickly than that of skill. This implies that a novice may become familiar enough with a sport structure to

verbally develop an appropriate response to a circumstance, but this does not mean that they could physically execute this response. This idea is further supported by an article written by Thomas and Thomas (1994). This article discusses the idea that a person/player can develop an expert or extensive knowledge base in sport, but still be inept in executing certain skills or movements. Therefore, in the continuum of expertise, it may be more probable and effective to begin by building a sufficient knowledge base rather than beginning with the refinement of motor skills. Further support for the idea of “knowledge first” is because knowledge precedes doing. In order for a person to perform the correct response, they must first know what response to perform.

This knowledge component includes both declarative and procedural knowledge. Declarative knowledge is factual information such as rules, goals, and sub goals of games (French & Thomas, 1987); procedural knowledge, on the other hand, is usually characterized in terms of a production system (Anderson, 1982). Procedural knowledge is described as an if-then statement for completing a proper response to stimuli. It involves choosing the appropriate action for certain circumstances within the context of a game (McPherson & French, 1991). Declarative and procedural knowledge are interrelated, but one is said to precede the other in acquisition.

Studies have suggested that a foundation of declarative knowledge is a necessity for the development of more complex procedural knowledge (Anderson, 1982; Chi & Glaser, 1980; Chi & Rees 1983). These authors support the thought that declarative knowledge is a network consisting of nodes and links, with each node representing a concept and the links being the associations between concepts. In this context, having a wider knowledge base

translates to having more nodes, more features for each node, and more links interconnecting these nodes (Chi & Glaser 1980). The larger the interconnection of this network of nodes and links the more retrievable information for each situation and higher probability of making a correct decision. Numerous studies have been conducted to examine this network idea and its differences between novices and experts. These studies have been done in many different domains, but we are interested in sport. A study on baseball suggested that experts have more concepts with more defining features than do novices (Chiesi, Spilich, & Voss, 1979). This shows that experts have a distinct advantage as a result of access to more and better organized information (French & Thomas, 1987). This access to more and better organized information can arguably lead to better decision making.

Understanding the exact effects knowledge has on game performance requires further research. However, a wider knowledge base has been shown to affect certain processes that directly correlate to game-play expertise. Research has shown knowledge to be a significant predictor of the decision making component in basketball performance (French & Thomas, 1987) and singles tennis (McPherson & Thomas, 1989).

Another issue for sport experts is the speed requirement in sport, where decisions must be accurate and rapid. In high strategy and fast-paced sports such as football, basketball, and soccer, it is essential for players to make very rapid decisions about the nature of the action to be performed (Thomas & Thomas, 1994). The accuracy and speed of decisions made in these situations has been directly correlated to the availability of a sufficient networking system of nodes and links. In order for fast and accurate decisions to be made, an individual must have access to the appropriate knowledge. The idea of a

sufficient networking system is supported by similar findings involving research in youth basketball (French & Thomas, 1987) and tennis (McPherson & Thomas, 1989). These studies yielded significant differences in problem solutions between expertise levels.

A similar study (French et al. 1995) found no differences between experts and novices in decision performance during baseball game-play performance. However, the lack of expert/novice differences in this study was attributed to the low frequency of complex decisions during game play and the continuous prompting of coaches and spectators. The majority of the literature illustrates differences between expert and novices when it comes to knowledge. Without the presence of this knowledge, expert levels of performance are likely not reached. In the event of achieving expertise, a continuum of stages must be fulfilled. Attaining declarative and procedural knowledge ranks among the primary of these stages, with skill and game performance to follow.

While a sufficient knowledge base is very important, understanding the limitations keeping a student or athlete from this knowledge is equally important. One of the biggest limitations when it comes to expertise is instructional resources. Access to a knowledgeable coach during the learning process is essential to skill development. Research has shown that time spent with an instructor is crucial to an athlete's overall development (Deakin & Coble, 2003). Given that a coach is normally responsible for a high percentage of an athlete's practice time, the coach's ability to devise an optimal learning environment becomes significant to an athlete's development (Baker & Horton, 2004).

Good coaching is good teaching and good teaching requires sufficient knowledge of the subject matter (Martens, 2004). A novice can only learn from a teacher as much as the



teacher has to offer. Many youth sport coaches do not possess the knowledge and experience necessary to develop athletes to expert levels. The coaches with extensive competitive backgrounds and experience in specific sports structures are those that are usually able to supply the level of knowledge required to reach expertise. Organized instruction, motivation, time management, and communication skills are all features of coaching expertise and effective coaching tactics and teaching.

In a study of swimming coaches (Rutt-Leas & Chi, 1993), differences between experts and non-experts were extended to the quality of instruction given to the athletes. When presented with a number of different swim strokes to analyze, the non-expert coaches offered more vague and superficial analyses, whereas, the expert coaches were very precise and specific in their assessment and recommendations for improvements (Baker & Horton, 2004). The knowledge base and experience that a coach holds has a direct influence on the development of their athletes and their path towards expertise. These levels of knowledge and experience are important in maximizing athletic development, and the debate remains today in trying to determine which means of obtaining this knowledge is most effective.

### **Video Games**

Considerable evidence has been produced defining barriers to achieving expertise. The question to how athletes and coaches break these barriers in the pursuit of sport expertise remains. A relatively new technique becoming more evident in the field of teaching and coaching is the use of video games as a model of instruction.

Video games are of particular interest because they have been shown to be very effective teaching tools (Swing & Anderson, 2008). Success using video games has been recorded in such diverse domains as classroom education (Corbett, Koedinger, & Hadley, 2001), marine training (Prensky, 2001), and certain surgical procedures. In sport, studies conducted in football (Londeree, 1967), baseball (Burroughs, 1984), ice hockey (Thiffault, 1974, 1980), and tennis (Haskins, 1965) have shown improvements to speed and accuracy of decision making through perceptual training. As stated before, decision making in sport is significantly affected by knowledge. Therefore, evidence suggests that the use of video simulation is an effective instrument in obtaining declarative and procedural knowledge in sports.

All models of instruction have strengths and weaknesses, and video games are no exception. The number of strengths video games offer outnumber the weaknesses. In the midst of many, the literature highlights two strengths of video games that make them very effective teaching tools. The first of these two attributes is the ability video games have to capture and hold attention through an emphasis on perceptual cues (Swing & Anderson, 2008). A study designed to use video games to enhance the control of force in putting demonstrated the use of perceptual cues. Fery and Ponserre (2001) stated that a golf video game may not provide proprioceptive inferences for putting, but they can give sufficient visual cues to enhance force control in this skill. Video games help a person learn appropriate cues for various situations that can be related to possible real-world situations. Therefore, a person is more inclined to use proper cues/response during a real-life situation resembling the situations learned from the video game.

Another advantage of a video game is that they offer clear objectives for the learner. This is important because these objectives/goals can be adapted to skills and knowledge of the player (Swing & Anderson, 2008). The games can also be adapted to each individual player's learning ability and pace of learning, which helps ensure that they learn the goals of the game. Video training provides realistic situations, and allows the individual player to react within its context. In a video game, the player may not respond appropriately or make the correct decision, but they receive immediate feedback. This feedback enables them to rethink their decision and ultimately lead to the correct response in a similar situation. The repetition and feedback of video games allow a player to learn correct decisions (accuracy) in the context of the game and use the learned information for future reference. Along with this learned accuracy, the repetition of the situational decision making leads to making faster decisions. Video training may help the accuracy of decisions made by players, but it most likely has an effect on how fast a player can make decisions (Starkes & Lindy, 1994).

Additional strengths to using video games as a teaching tool include:

- Team or opponent not required
- Hand-eye coordination
- Over learning/Repetition
- Fast and precise feedback
- Specific vs. general content
- Feeling of competence
- Motivating
- Shows all steps necessary
- Creates networking in mind/knowledge structures
- Challenging but doable
- Achieve mastery
- On or off season
- Minimal equipment/facility requirement
- Self-paced learning
- Coach not needed to be present
- Used for all levels
- Used when healthy or injured
- Capture and hold attention

The video representation of real-life sport situations increases declarative and procedural knowledge. The experience and repetition of these contextual situations increase the knowledge of both correct and incorrect responses, which leads the player to understand what decisions are best for certain situations. The more declarative and procedural knowledge gained the faster and more accurate the decisions are made in the context of game-play. Learning these video or virtual representations builds on the knowledge stores of the participants and allows the application of the new knowledge to real-life sport-related situations.

## **METHOD**

### **Participants**

For this study 40 novice coaches (someone interested in football, but has never coached) ranging in age from 18-30 were recruited. Participants were recruited from college classes using both flyers (see Appendix B) and word of mouth. The participants recruited had varying backgrounds and different levels of experience (amount of football played) in both football and video games. French and Thomas (1987) noted significant changes in basketball knowledge; however they did not report the standard deviations or effect sizes. Similarly, Bartholow and Anderson (2002) found significant effects due to video game play but did not report standard deviations. Anderson and Bushman (2001) conducted a meta-analysis with significant effects from video game play, but the average effect sizes reported were small (-0.17 to -0.22) while the number of participants were large (695-4400). Forty participants with an effect size of 0.7 or larger have a power of .8 or higher. To achieve power of 0.8 or higher 40 participants was the goal of recruitment for this study. However, only 27 individuals took part in this study. There was no extrinsic reward offered for participation in this study while a time commitment of approximately seven hours (six separate meetings) was required in the protocol. This created difficulty in finding participants willing and able to take the time to participate in the study. All 27 participants that started the study finished the study in its entirety (no dropouts). Informed consent (see Appendix B) was obtained from all participants and the project was approved by the IRB.

## **Instrumentation**

*Football Knowledge Test.* A 50-item multiple choice test was constructed and used to assess football knowledge (see Appendix B). The items assessed both the participant's declarative and procedural knowledge in areas such as rules, player positions, terminology, strategy, proper technique, and situational decision making ability. The test included 25 items that represented procedural knowledge, even though knowledge tests are viewed as assessing declarative knowledge.

The first draft of the test was developed using a table of specifications based on two sources of football knowledge ([www.afca.com](http://www.afca.com) and [www.ncaa.org](http://www.ncaa.org)). To further test content validity, the test was reviewed by two experienced football coaches and revised based on their comments. The test was administered to five volunteers with varying football experience. Those volunteers took the test on two occasions and the test-retest reliability was calculated. Test-retest reliability (KR-20) was accepted at .7 or above for the small sample in the pilot.

*Survey of Experience.* This survey determined both football and video game experience. It included questions regarding past experience: participation history, current participation, level played, coaching experience, interest in football, video game experience and other information regarding football and video game familiarity (see Appendix B).

*Electronic System Selection.* The platform known as the X-Box 360 was used to display the virtual information to each participant. The X-box 360 allowed for a better visual representation of the cues and situations experienced in the virtual simulation compared to

other video alternatives (ex. Wii). The X-box focused more on decision making and declarative knowledge within the context of the game rather than manipulative movements of controls and hand-eye coordination. This made the X-box more appropriate for this study.

*Video Game Selection.* Madden 2008 was the game used for this study because it ranks among the best of recent video games representing real-life situations, rules, regulations, and strategies. The game allowed for two important opportunities. First, at the end of practice sessions, game results (statistics) were provided. These were then recorded and used to represent each practice performance. These results were used to assure the participant's engagement at each practice session. Second, various levels of difficulty were possible in Madden 2008. As participants improved in video game-play, the level of difficulty in the game/competition increased accordingly to assure each participant the opportunity to improve. Participants were evaluated on both the results of each individual practice (game statistics) and the difficulty in the level of play achieved.

## **Procedures**

Participants came to the Pedagogy Lab for all testing. There were two testing sessions (one pre- and one post-intervention) and three weeks of practice (intervention). During the pre-test session, participants read and signed the informed consent (see Appendix B), completed the football/video game experience survey (see Appendix B), took the knowledge test for the first time, and scheduled six practice sessions for the intervention. The informed consent included a request that participants do not play any football video games outside the study until their participation in the study is complete. The remainder of the pre-test session was used for the participants to become familiar with the game,

controllers, and procedure. This was done through the use of Madden 2008 mini-games. Each participant took part in four mini-games. These mini-games enabled the participants to become familiar with the characteristics of the controller along with the visual representation of Madden 2008 on the television screen. These mini-games helped reduce the effects of a video game learning curve when the intervention began. A pilot was used prior to the study design to help control for effects of a video game learning curve. The pilot work gave feedback on the mini-games that were the most beneficial for familiarizing participants with the gaming system and visual representation. The pilot showed four mini-games to be the most beneficial to reducing the learning curve. These same four mini-games were used for each participant during the pre-test session.

The post-test session took place during the last or sixth practice session of the intervention. The cognitive test (administered for second time) was taken immediately following the completion of the last practice session. Once the post-test was completed, the participants were given a post-test survey (see Appendix B) regarding how much exposure to football and football video game play was done outside the experiment. The survey included questions such as: “Have you attended a football game since the beginning of this study? Have you read about or studied football since you started this study? Have you watched football on TV? Have you played Madden 2008 during this study other than the intervention? Are you interested in coaching football? How confident are you in your ability to coach football at this time?” This helped to better understand the true effect of the intervention. This procedure was the same for all participants.



There were six practice sessions over a three-week period that lasted approximately one hour each. These sessions were consistent for each participant and involved the same or similar situations for each session. The game was loaded and ready to play upon the participant's arrival starting with the coin flip. The game consisted of a home team (controlled by participant) and an away team (computer controlled). The New England Patriots football team was used as both the home and away team during each practice session. This was done for consistency between participants and practice sessions. The game settings were consistent for each session of the intervention. They were set to best simulate a real-life football game in "normal" conditions (sunny, no wind, no precipitation, etc). The quarters were set to 5 minutes instead of a real football quarter of 12 (high school) minutes due to time constraints. At the end of each quarter, statistics were recorded. At the end of each practice session, each participant was asked to refrain from reading, studying, playing, or watching football until finished with the study.

Each individual experience during the 20 minute simulation of a football game was unique. The scenarios and situations experienced during these simulation games cannot be controlled. Each game played had a wide variety of scenarios and interactions within the context of the game of football. Each participant partook in approximately 20-25 downs (individual plays or scenarios) during each five minute quarter, which yielded around 80-100 total plays for the entire 20-minute game. The simulation experienced by one participant differed from that of the other participants, but the second portion of each practice session involved a protocol of constant scenarios across all participants.

Each practice session had a set of six consistent scenarios. These scenarios were carried out at the end of each practice session following the 20-minute simulation. In these six scenarios, the participant was responsible for the offensive decision making whereas everything else was controlled and constant (defense, score, time remaining, down/distance, etc). The context for these scenarios was presented visually to the participants using flash cards which were constructed to mirror the look of a football scoreboard (see Appendix B). They included all the necessary information needed for a coach to make an informed decision surrounding a football scenario. Using the knowledge provided by the situational scenarios (flash cards), the participant then was required to choose what they thought to be the most appropriate decision in the given situation. Upon the presentation of each flashcard, a 25-second timer (representing a high school play clock) was started simultaneously. Once the situational scenario had been provided, the participant had 25 seconds to make their decision to the situation. Each decision (offensive selection) relating to the given scenario was recorded along with the amount of time it took to make the decision. This data was used to test accuracy (play selection) and speed of decisions (decision time).

These scenarios offered a consistency between participants that ensured each was experiencing at least six of the same scenarios during each practice session. There was a set of six scenarios designated for each practice session. The scenarios were similar in their context, but not identical. The six scenarios were standard and constant for each participant in each session meaning that each participant was exposed to the same set of six scenarios during the same practice session. These scenarios were used to help understand participant knowledge of football and if this knowledge was increasing throughout the intervention.

The standard scenarios used during the practice sessions were directly correlated to 24 questions on the cognitive test, ensuring that each participant experienced at least six constant scenarios during each session and was a means of measurement of knowledge gained within the intervention.

Certain benchmarks were set in order to determine the difficulty in level of play at which each participant competed. All participants began at the game's second level (Pro). Total offensive output was the benchmark used to determine the advancement in level of difficulty. The difficulty level increased by one level each time a participant reached 400 yards of total offense. When this benchmark was met, then the level of difficulty was increased by one level before the start of the next practice session. Difficulty of play continued to increase one level each time the benchmark was reached to assure each participant was challenged during practice and allowed the chance to improve.

### **Design and Analysis**

The study design was a simple pre-post design with an intervention of six video game play sessions. The analysis for the main question was a dependent t-test on the total knowledge test score pre and post. In order to assess the benefits of practice, a repeated measures MANOVA was completed with practice sessions (stats) as the repeated measures, and total yards and correct decisions within the time (scenarios) as dependent variables.

## RESULTS

The dependent variables used in the data analysis were knowledge score, total yards, level of video play, win/loss ratio, accuracy of decisions, and speed of decisions. There were other variables among the data collected, but these were the variables that yielded data in a more normal distribution allowing for a better interpretation of the results. In the analysis of the data, the game stats were corrected for the level of difficulty. There were three levels of difficulty in the intervention. In order to associate a higher value or improvement with the higher the level of difficulty, the game stats (total yards) were multiplied by the level of difficulty (pro = 1, all-pro = 2, all-madden = 3) attributing higher values to the participants who improved to the higher levels of difficulty.

### Hypothesis 1

Three analyses were completed on the same data; therefore Bonferroni was used to correct the alpha ( $.05/3=0.0167$ ). To test the first hypothesis (declarative and procedural knowledge increased from pre to post-knowledge test) a dependent t-test was calculated. Knowledge test scores increased significantly from pre-test to post-test, therefore, the hypothesis was supported [ $t(26)=-4.997, p=0.0001$ ] based on the significant t-test. The improvements were moderate ( $es=0.57$ ). Descriptive data for the pre and post knowledge test scores are presented in Table 1.

### Hypothesis 2

To test the second hypothesis that video games improve the accuracy and speed of decisions in game scenarios the participants were divided into two groups, a low ( $n = 12$ ) and

high ( $n = 15$ ) knowledge group. The two groups were formed based on the post-knowledge test scores (mean number correct out of 42). The mean number correct (37) was used as the cut-point. The confidence intervals indicate that there was no overlap between the newly formed groups at either the pre or post test for knowledge (Table 2). A group by time ( $2 \times 6$ ) MANOVA produced significant within subjects effects for speed [ $F(1, 25) = 29.99$ ,  $p = .0001$ ], total yards [ $F(1, 25) = 9.99$ ,  $p = .0001$ ] and level of video play [ $F(1, 25) = 14.06$ ,  $p = .0001$ ] but not for accuracy of decisions or win-loss record. No within subject interactions were significant. None of the between subjects effects (knowledge group) were significant. Win-loss was the only dependent variable approaching significance at  $p = .08$ . Descriptive data for this MANOVA is presented in Table 3.

### **Hypothesis 3**

An additional question of interest was whether or not previous football experience influenced the intervention. To address the question three experience groups were formed based on previous football experience: low ( $n = 8$ ), moderate ( $n = 12$ ) and high ( $n = 7$ ). The MANOVA repeated measures for experience by time ( $3 \times 2$ ) produced three significant time (pre-post) main effects for knowledge [ $F(1,24) = 24.83$ ,  $p = .0001$ ], speed [ $F(1,24) = 47.06$ ,  $p = .0001$ ], and total yards [ $F(1,24) = 8.2$ ,  $p = .008$ ] and one interaction for accuracy [ $F(2,24) = 6.5$ ,  $p = .006$ ]. No between subjects effects were significant, with accuracy the only variable approaching significance ( $p = .056$ ). Descriptive data for this MANOVA is presented in Table 4.

## Item Analysis

The knowledge test included 50 multiple choice items covering declarative and procedural knowledge of football. The item analysis showed eight items from the test having a low item quality (point biserial  $< .10$ ). Of these eight items, three were too easy (answered correctly by nearly 100% of participants), while the other five items had low item quality due to poorly structured questions and a higher level of difficulty (questions: 8, 24, 27, 35, 50). These eight items were thrown out and the analyses were completed using the remaining 42 test items. There was a wide range of performance ( $m=34.8$  correct,  $s=5.3$ , minimum=15, maximum=42). The KR 20 of .80 showed the test has a high internal consistency. Thus, the test was declared reliable. The frequency distribution includes a trend of increasing scores from pre to post intervention. The pre-test scores have only five test scores in the highest two interval ranges (38-39 and 40-42) and four tests of 27 or below, whereas the post-test scores have 13 test scores (nearly half) that fall in the top two intervals with no tests below a 27. The overall trend includes an improvement of test scores from pre to post intervention with an average number of items correct being 33.07 in the pre-test and 36.56 in the post-test.

Six real-life game scenarios were presented to the participants at the end of each practice session. Table 5 represents the responses participants gave to these scenarios. Table 5 breaks down the number of responses (out of 27 participants) that was given to each separate scenario. Each participant chose one response for each scenario, and the total responses of all participants are displayed in the Table 5. The percentage of correct responses can be seen in the last column. In each practice session there were five scenarios that had one correct answer, along with one scenario that was considered a gray scenario (one

answer is considered correct, but others were possible, but poorer choices ). Table 5 shows the higher difficulty associated with the gray scenarios (the % correct shaded gray). The average correct response percentage for the gray scenarios was 72%, whereas the average for the rest of the scenarios was 88%. The easiest scenarios were when passing was the best choice (96% correct), and the most difficult was punting (78% correct). Considering incorrect responses, the most frequently used when the choice was poor or incorrect was passing (60%). Punting was never selected as a poor choice and deep (DP) kick, FG and onside (OS) kick were selected 10% or less of the time as poor or incorrect choices.

## **DISCUSSION**

The discussion focuses on three findings: the increase of declarative and procedural sport knowledge via video representation (Hypothesis 1), the effect of video game practice on speed and accuracy of decisions in game scenarios (Hypothesis 2), and the increase of knowledge relative to initial football experience (Hypothesis 3).

One of the single biggest challenges facing teachers and coaches is increasing knowledge for themselves and their students or athletes (Seidentop, 2004). Expert or high caliber athletes and coaches excel within their sport, in part, due to their significant stores of procedural and declarative knowledge (Chamberlain & Coelho, 1993). The attainment of this knowledge enables novices to progress toward expertise in their sport. However, it has been a challenge to find an efficient resource that helps make this increase in knowledge both cost and time efficient. Consistent with the theory and research in sport expertise, the participants in this study increased knowledge as a result of video game play and those with more expertise and more knowledge performed better than less experienced participants in video game play.

### **Hypothesis 1**

As expected, the knowledge level increased with exposure to the video game intervention. Knowledge, based on a written knowledge test, increased significantly in this study. The moderate effect size ( $es=.57$ ) showed that the intervention had a significant and meaningful influence on the outcome of the knowledge scores. This is particularly important because the time for the intervention was short (six sessions) and the intervention was simple (play video games). Previous literature has shown that video games were effective teaching



tools (Swing & Anderson, 2008), but little research has been done on video game's effect on the increase of knowledge in sport. The results show the difference in the knowledge test scores from pre-to-post intervention were at a significant level, which supports the idea that video games can be used to increase a knowledge base in the attempt to increase expertise. The knowledge test performance from pre to post validates the use of video games as effective tools in enhancing sport knowledge. The fact that participants with better knowledge did better on the video game suggests that the video game is a valid measure of football knowledge.

## **Hypothesis 2**

A second measure of knowledge that is particularly important in sport experts is procedural knowledge. In this case, scenarios were used to determine the speed and accuracy of decisions. In sport, speed in decision making has been identified as a critical feature in success. The ability to make rapid, accurate decisions in sport is a characteristic that sets experts apart from novices. In sports such as football (fast paced/high strategy), the speed of decisions regarding the action to be performed are associated with level of success (Thomas & Thomas, 1994). The speed at which these decisions are made is directly related to the knowledge base attained. In order to be fast and accurate in the decision making process, the appropriate knowledge must be available (French & Thomas, 1987; McPherson & Thomas 1989).

This study yielded results both supporting and opposing previously viewed literature. The within subject effects showed a significant decrease in the speed required to make decisions during game scenarios ( $m = 13.98$  s to  $10.67$  s); however, the accuracy of these

decisions did not yield a significant improvement ( $m = 85.8\%$  to  $90.12\%$ ). The between subjects (knowledge groups) results were vice versa, yielding a significant difference in the accuracy of the decisions with no difference in the speed. This says that from practice one to practice six (time) the average speed of decisions improved significantly, but accuracy did not. However, when comparing high and low knowledge groups (based on pre-knowledge test score) the accuracy of decisions was significantly higher for the high knowledge group, whereas the speed had no significant difference. All participants improved their speed of decision making, but the difference in accuracy was related to the knowledge level of the participants. This can be explained by French et al (1996) with the explanation that the acquisition of knowledge can help increase the correct response in game-play situations leading to higher success levels. However, these aspects of sport knowledge are obtained in early years of participation, explaining why novices often lack the declarative and procedural knowledge necessary for making correct decisions. The results from this study show a consistent improvement of speed across participants, but the better accuracy is held by those with the higher level of knowledge. These findings support the idea that knowledge improves both speed and accuracy of decisions, but these improvements may express differently at various knowledge levels.

### **Hypothesis 3**

Declarative knowledge (e.g., rules, definitions) is the lowest and first knowledge mastered, followed by procedural knowledge. Both types of knowledge in sports have been related to experience (French et. al, 1996). Generally more experience has been associated with more knowledge and expertise. The data from this study support the hypothesis. The time main effects showed an improvement in knowledge, speed of decisions, and total yards

(game-stats). In this case increasing time was increasing experience, showing that on average all participants improved in these categories from practice one to practice six. The group main effects (between subjects) have no significant differences showing that the improvements are consistent across all levels of experience. This supports the hypothesis that all participants increase knowledge regardless of their initial experience.

When group by time interactions were run, only accuracy yielded a significant interaction. The interaction showed that accuracy of scenario decisions was affected by the level of experience in football. The greatest change in accuracy took place at the low level of football experience (up to one year of high school football), while both the moderate (2-4 years high school football) and high (college football) level experience groups showed little change in accuracy of decisions. The accuracy scores for the low experience group showed a significant improvement from practice session one to practice session six. The scores improved by nearly 20 percent over the intervention. A change this large cannot be attributed to regression toward the mean (although it may have had an effect).

The insignificant change in accuracy scores for the moderate and high experience group can be attributed to a plateau effect. The accuracy scores began to level off (plateau effect) between the low and moderate experience groups. Accuracy scores for the low experience group were 71 percent at practice session one and 92 percent at practice session six. The moderate and high experience groups had accuracy scores of 90 and 95 percent at practice session one, leaving little room for improvement over the intervention. The high scores at the beginning of the study show a possible ceiling effect taking place at the upper two levels of experience explaining the significant interaction between experience groups.

The results show that knowledge increased regardless of experience level, but the level of experience did have an effect on the amount of improvement in the decision making accuracy.

### **Limitations**

The recruitment for this study was not random due to the need for novice coaches of a certain age. In addition, only 27 participants took part in the study creating a limitation in the study due to the decrease in power. A larger sample size in future research is better for more reliable and powerful results.

This study design did not include a control group, leaving questions in the overall effects of the intervention on the pre-to-post knowledge tests. If the study is replicated the use of a control group should be administered to better understand the effects of the intervention.

Information about the football experience, video-game play experience, and football and video game exposure during the intervention was gathered by surveys, assuming honesty of all participants. Also, each participant was asked not to participate in football video games during the intervention. The study design assumed that the participants abide by the parameters of the study design. There is no way to have complete control of these variables.

Games stats were corrected for level of difficulty by multiplying the total offensive statistics by the set level of difficulty during a practice session. This assumes a linear relationship when changing between the three levels of difficulty on Madden '08. It is

assumed that the increase in level from pro to all-pro is the same as the increase in level from all-pro to all-madden. Outside variables must be controlled for to make this assumption.

The intervention took only offensive game statistics and offensive scenarios into consideration (video game is more biased to offense). The results of the study were consistent with offensive statistics and not wins and losses. This was in part due to the fact that win-loss in a game is a categorical variable while other statistics are continuous variables. During the intervention there were other uncontrolled variables that could influence the outcome of the simulation such as defensive play and special teams. Future studies should find a method that takes all these variables into account. Also, the intervention only included a total of six practice session consisting of one game and 6 scenarios. This is a short exposure to practice in relation to the actual game of football and the work required to become successful. An intervention that includes more scenarios and exposure to football related information could yield different results. A study design and analysis taking into consideration offensive, defensive, and special team variables can produce a better representation regarding overall football knowledge. These modifications lead to making video games a more effective tool in both assessing and generating a broader knowledge base.

### **Future Recommendations**

Video games have been shown to be useful tools in increasing both knowledge and skill, but rarely have they been used in the realm of sport. Past studies have shown video games to increase knowledge and create effective training methods in areas unrelated to sport (Corbett, Koedinger, & Hadley, 2001; Prensky, 2001), and even their use in sport to increase

speed and accuracy in decision making (Londeree, 1967; Burroughs, 1985; Thiffault, 1980; & Haskins, 1965). This study shows different patterns in video games effects on knowledge and performance. However, there are unanswered questions about the use of video games to enhance sport performance and coaching potential. Video games have the potential to be a cost/time effective method of decreasing the gap between novice and expert, and future research can help construct an efficient method of increasing sport knowledge and expertise.

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## APPENDIX A: TABLES

Table 1. Descriptive data for the knowledge test at pre and post intervention in percent correct of 42 possible.

				95% Confidence Interval	
	<u>n</u>	<u>Mean</u>	<u>Sd</u>	<u>Lower boundary</u>	<u>Upper boundary</u>
Pre-Knowledge Test	27	79	14.4	73	85
Post-Knowledge Test	27	87	8.9	84	91

Table 2. Descriptive statistics for high and low knowledge groups at pre and post test (percent correct out of 42).

					95% Confidence Interval	
	<u>Group</u>	<u>n</u>	<u>Mean</u>	<u>Sd</u>	<u>Lower boundary</u>	<u>Upper boundary</u>
Pre-Knowledge Test	Low	12	70	17	59	81
	High	15	86	7	82	89
Post-Knowledge Test	Low	12	78	7	75	83
	high	15	94	3	92	95

Table 3. Descriptive data for the MANOVA repeated measures with two groups (high and low knowledge) and time (six practice sessions) for dependent variables of speed and accuracy of decisions, level of play, win/loss, and total offensive yards.

				95% Confidence Interval	
	Knowledge Group	Mean	Std Error	Lower boundary	Upper boundary
Main effect group					
Accuracy	Low	82.64	2.2	78.06	87.21
	high	87.41	1.99	83.31	91.50
Speed of decisions	Low	12.18	0.56	11.13	13.43
	high	12.87	0.50	11.84	13.09
Win/loss	Low	0.63	0.10	.42	.83
	high	0.87	0.09	.69	1.01
Total offensive yards	Low	337	54	226	448
	high	341	48	242	440
Level of play	Low	1.26	0.11	1.05	1.48
	high	1.28	0.09	1.08	1.47
Time main effect (repeated measure)					
Level	1	1.00	.00	1.00	1.00
	2	1.08	.05	.97	1.19
	3	1.14	.07	.99	1.29
	4	1.26	.11	1.05	1.48
	5	1.49	.13	1.23	1.76
	6	1.66	.14	1.38	1.94
Wins	1	.55	.10	.35	.76
	2	.59	.10	.39	.80
	3	.86	.11	.62	1.09
	4	.80	.12	.55	1.05
	5	.79	.15	.48	1.10
	6	.88	.19	.49	1.28
Total offense	1	253	19.15	213	293
	2	262	22.14	217	308
	3	312	35.21	240	385

Table 3. Descriptive data for the MANOVA repeated measures with two groups (high and low knowledge) and time (six practice sessions) for dependent variables of speed and accuracy of decisions, level of play, win/loss, and total offensive yards.

				95% Confidence Interval	
	Knowledge Group	Mean	Std Error	Lower boundary	Upper boundary
	4	344	42.29	256	431
	5	414	51.62	308	521
	6	448	69.52	305	591
Accuracy	1	85.83	2.99	79.68	91.98
	2	80.83	3.38	73.87	87.79
	3	81.80	2.97	75.68	87.92
	4	87.22	2.72	81.62	92.82
	5	84.72	2.81	78.92	90.52
	6	89.72	2.35	84.88	94.56
Speed	1	16.90	.94	14.96	18.85
	2	13.98	.57	12.81	15.17
	3	11.48	.44	10.57	12.39
	4	11.82	.46	10.88	12.77
	5	10.66	.30	10.05	11.27
	6	10.62	.36	9.87	11.36

Table 4. MANOVA repeated measures experience group by pre-post.

				95% Confidence Interval	
	<u>Effect</u>	<u>Mean</u>	<u>Std error</u>	<u>Lower boundary</u>	<u>Upper boundary</u>
Time main effects (three significant)					
<b>Knowledge test</b>	<b>Pre</b>	<b>33</b>	<b>1.16</b>	<b>31</b>	<b>35</b>
	<b>Post</b>	<b>37</b>	<b>0.73</b>	<b>35</b>	<b>38</b>
<b>Speed of decisions</b>	<b>1</b>	<b>16.64</b>	<b>.95</b>	<b>14.68</b>	<b>18.59</b>
	<b>6</b>	<b>10.67</b>	<b>.36</b>	<b>9.92</b>	<b>11.42</b>
<b>Total offensive yards</b>	<b>1</b>	<b>248</b>	<b>19.23</b>	<b>208.45</b>	<b>288.07</b>
	<b>6</b>	<b>420</b>	<b>67.29</b>	<b>280.86</b>	<b>588.62</b>
Win-loss	1	.54	.10	.33	.75
	6	.56	.10	.35	.78
Group main effects (none significant)					
Grouped by experience level:					
Low = elementary, junior high, or up to one year of high school football experience (n = 8)					
Mod = 2-4 years of high school football experience(n = 12)					
High = college football experience (n = 7)					
Knowledge	Low	32.25	1.61	28.93	35.57
	Mod	35.58	1.31	32.87	38.30
	High	36.43	1.72	32.86	39.98
Speed of decisions	Low	13.13	1.00	11.06	15.19
	Mod	14.23	0.82	12.55	15.91
	High	13.61	1.07	11.40	15.81
Accuracy	Low	81.25	3.14	74.76	87.73
	Mod	90.97	2.57	85.68	96.26
	High	90.48	3.36	83.54	97.41
Wins	Low	.50	.12	.26	.74
	Mod	.58	.10	.39	.78
	High	.57	.13	.31	.83
Total offensive yards	Low	291.31	70.59	145.62	437.01
	Mod	432.63	57.64	313.67	551.58

	High		278.07	75.47	122.32	433.83
Group (experience) by time (pre-post) interaction (one significant)						
<b>Accuracy</b>	<b>Low</b>	<b>Pre</b>	<b>70.83</b>	<b>4.10</b>	<b>62.28</b>	<b>79.37</b>
		<b>Post</b>	<b>91.67</b>	<b>4.48</b>	<b>82.42</b>	<b>100.91</b>
	<b>Mod</b>	<b>Pre</b>	<b>90.28</b>	<b>3.38</b>	<b>83.30</b>	<b>97.25</b>
		<b>Post</b>	<b>91.67</b>	<b>3.66</b>	<b>84.12</b>	<b>99.21</b>
	<b>High</b>	<b>Pre</b>	<b>95.24</b>	<b>4.43</b>	<b>86.10</b>	<b>104.37</b>
		<b>Post</b>	<b>85.71</b>	<b>4.79</b>	<b>75.83</b>	<b>95.59</b>
Knowledge	Low	Pre	39	2.08	26	34
		Post	35	1.30	32	37
	Mod	Pre	34	1.70	31	38
		Post	37	1.07	35	39
	High	Pre	35	2.22	30	40
		Post	38	1.39	35	41
Speed	Low	Pre	14.63	1.70	11.21	18.13
		Post	11.63	1.70	11.21	18.13
	Mod	Pre	18.00	1.39	15.14	20.86
		Post	10.46	0.53	9.36	11.55
	High	Pre	17.29	1.82	13.54	21.03
		Post	9.93	0.70	8.50	11.36
Win-loss	Low	Pre	.375	.181	.002	.748
		Post	.625	.185	.243	1.007
	Mod	Pre	.667	.147	.362	.971
		Post	.500	.151	.188	.812
	High	Pre	.571	.193	.173	.970
		Post	.571	.198	.163	.980
Total Offensive Yards	Low	Pre	254	34.52	182.75	325.25
		Post	328	120.44	80.05	577.20
	Mod	Pre	275	28.19	216.91	333.26
		Post	590	98.34	387.21	793.13
	High	Pre	215	36.91	139.54	291.88
		Post	340	128.75	74.69	606.16

Table 5. Scenario Breakdown: exhibits play selections for each practice session and the corresponding percent of correct selections (numbers in **bold** are the best choice for each scenario and **shaded** boxes are gray scenarios).

<u>Scenario</u>	<u>Run</u>	<u>Pass</u>	<u>Punt</u>	<u>FG</u>	<u>DP Kick</u>	<u>OS Kick</u>	<u>%</u>
Practice Session 1							
1-1	2	5	<b>19</b>	1	0	0	70.4
1-2	0	0	0	0	<b>26</b>	1	96.3
1-3	<b>18</b>	9	0	0	0	0	66.7
1-4	0	<b>27</b>	0	0	0	0	100
1-5	0	2	0	<b>25</b>	0	0	92.6
1-6	<b>24</b>	3	0	0	0	0	88.9
Practice Session 2						AVG:	85.82
2-1	1	<b>26</b>	0	0	0	0	96.3
2-2	6	5	<b>16</b>	0	0	0	59.3
2-3	0	6	0	<b>21</b>	0	0	77.8
2-4	<b>24</b>	3	0	0	0	0	88.9
2-5	3	3	0	<b>21</b>	0	0	77.8
2-6	0	0	0	0	4	<b>23</b>	85.2
Practice Session 3						AVG:	80.88
3-1	0	0	0	0	<b>26</b>	1	96.3
3-2	0	0	0	0	<b>14</b>	13	51.9
3-3	4	5	<b>18</b>	0	0	0	66.7
3-4	0	4	0	<b>23</b>	0	0	85.2
3-5	0	<b>27</b>	0	0	0	0	100
3-6	<b>24</b>	3	0	0	0	0	88.9
Practice Session 4						AVG:	81.5
4-1	7	<b>20</b>	0	0	0	0	74.1
4-2	<b>24</b>	2	0	1	0	0	88.9



Table 5. Scenario Breakdown: exhibits play selections for each practice session and the corresponding percent of correct selections (numbers in **bold** are the best choice for each scenario and **shaded** boxes are gray scenarios).

<u>Scenario</u>	<u>Run</u>	<u>Pass</u>	<u>Punt</u>	<u>FG</u>	<u>DP Kick</u>	<u>OS Kick</u>	<u>%</u>
4-3	0	<b>27</b>	0	0	0	0	100
4-4	0	5	<b>22</b>	0	0	0	81.5
4-5	0	0	0	0	<b>27</b>	0	100
4-6	2	3	0	<b>22</b>	0	0	81.5
Practice Session 5						AVG:	87.67
5-1	<b>26</b>	0	0	1	0	0	96.3
5-2	2	7	0	<b>18</b>	0	0	66.7
5-3	0	8	<b>19</b>	0	0	0	70.4
5-4	0	0	0	0	6	<b>21</b>	77.8
5-5	0	0	<b>27</b>	0	0	0	100
5-6	0	<b>27</b>	0	0	0	0	100
Practice Session 6						AVG:	85.2
6-1	0	3	0	<b>24</b>	0	0	88.9
6-2	0	<b>27</b>	0	0	0	0	100
6-3	0	0	0	0	<b>27</b>	0	100
6-4	2	1	0	<b>24</b>	0	0	88.9
6-5	<b>17</b>	10	0	0	0	0	63.0
6-6	0	0	<b>27</b>	0	0	0	100
						AVG:	90.13
<i>Percentage of correct response by play type</i>							
Corr. Response	83.09%	95.77%	78.33%	82.43%	88.9%	81.5%	
<i># of incorrect or poor responses by play type</i>							
Inc. Response	29	87	0	3	10	15	= 144
Percentage	20.14%	60.42%	0%	2.08%	6.94%	10.42%	

Table 6. Knowledge test statistics.

<u>Statistic</u>	<u>50 Items</u>	<u>42 Items</u> (excluding 8 low quality items)
Number of Tests Graded	54	54
Number of Graded Items	50	42
Total Points Possible	50.00	42.00
Max Score	48.00	42.00
Min Score	22.00	15.00
Range of Scores	26.00	27.00
Mean Score	41.09	34.81
Median Score	42.00	36.00
Variance	28.46	28.041
Standard Deviation	5.34	5.30
Kuder-Richardson Formula 20	0.80	0.80
Mean Percent Score	82.19	82.89

Table 7. Frequency Distribution (scores out of 42 test items).

<u>Interval</u>	<u>Total Score</u>	<u>Pre-test Frequency</u>	<u>Post-test Frequency</u>
1	40-42	3	6
2	38-39	2	7
3	36-37	6	4
4	34-35	4	5
5	32-33	6	2
6	30-31	0	2
7	28-29	2	0
8	26-27	1	1
9	24-25	0	0
10	22-23	1	0
11	20-21	1	0
12	18-19	0	0
13	16-17	0	0
14	14-15	1	0

Table 8. Item Statistics (n = 54): **bold** items are the eight identified as low quality.

<u>Item #</u>	<u>Item Difficulty</u> (values in percent)	<u>Item Discrimination</u> (Point Biserial)	<u>All Answers Used</u>
1	48.15	.43	4 – 4
2	85.19	.28	3 – 4
3	81.48	.04	3 – 4
4	72.22	.46	3 – 4
5	96.30	.59	2 – 4
6	92.59	.20	2 – 4
7	92.59	.38	3 – 4
<b>8</b>	<b>74.07</b>	<b>.03</b>	<b>2 – 5</b>
<b>9</b>	<b>100.00</b>	-	<b>1 – 4</b>
10	98.15	.21	2 – 4
11	61.11	.36	4 – 4
<b>12</b>	<b>100.00</b>	-	<b>1 – 4</b>
13	98.15	.49	2 – 4
14	46.30	.45	4 – 4
15	74.07	.58	4 – 4
16	88.89	.41	3 – 4
17	85.19	.50	4 – 4
18	85.19	.68	4 – 4
19	94.44	.37	3 – 4
20	70.37	.44	4 – 5
21	96.30	.33	3 – 4
22	92.59	.39	3 – 4
23	83.33	.24	4 – 4
<b>24</b>	<b>75.93</b>	<b>.13</b>	<b>2 – 4</b>
25	33.33	.31	4 – 4

Table 8. Item Statistics (n = 54): **bold** items are the eight identified as low quality.

<u>Item #</u>	<u>Item Difficulty</u> (values in percent)	<u>Item Discrimination</u> (Point Biserial)	<u>All Answers Used</u>
26	94.44	.31	2 – 4
<b>27</b>	<b>38.89</b>	<b>.06</b>	<b>4 – 4</b>
<b>28</b>	<b>100.00</b>	-	<b>1 – 4</b>
29	74.07	.20	2 – 4
30	79.63	.28	4 – 4
31	85.19	-.08	4 – 4
32	94.44	.00	2 – 4
33	92.59	.14	3 – 4
34	83.33	.33	4 – 4
<b>35</b>	<b>59.26</b>	<b>.14</b>	<b>4 – 4</b>
36	77.78	.44	2 – 4
37	56.60	.42	3 – 4
38	90.74	.23	3 – 4
39	85.19	.58	3 – 4
40	94.44	.47	2 – 4
41	90.74	.56	3 – 4
42	72.22	.50	4 – 4
43	92.59	.31	3 – 4
44	96.30	.21	3 – 4
45	96.30	.32	2 – 4
46	88.89	.69	2 – 4
47	90.74	.16	3 – 4
48	94.44	.29	3 – 4
49	75.93	.54	3 – 4
<b>50</b>	<b>79.63</b>	<b>-.03</b>	<b>2 – 4</b>

## APPENDIX B: MATERIALS FROM DATA COLLECTION

### Research Collection Schedule

#### Initial Appointment

- ☐ Informed Consent Document
- ☐ Experience Questionnaire
- ☐ Football Knowledge Test (50-item Multiple Choice Test)
- ☐ Mini-Games Practice Session

#### Appointment #2

- ☐ XBOX 360 Game-Play (5 minute quarters)
  - Games Statistics collected at end of each quarter.
- ☐ XBOX 360 Game Scenarios (6 different scenarios)
  - Play selection/Decision time recorded

#### Appointment #3

- ☐ XBOX 360 Game-Play (5 minute quarters)
  - Games Statistics collected at end of each quarter.
- ☐ XBOX 360 Game Scenarios (6 different scenarios)
  - Play selection/Decision time recorded

#### Appointment #4

- ☐ XBOX 360 Game-Play (5 minute quarters)
  - Games Statistics collected at end of each quarter.
- ☐ XBOX 360 Game Scenarios (6 different scenarios)
  - Play selection/Decision time recorded

#### Appointment #5

- ☐ XBOX 360 Game-Play (5 minute quarters)
  - Games Statistics collected at end of each quarter.
- ☐ XBOX 360 Game Scenarios (6 different scenarios)
  - Play selection/Decision time recorded

#### Appointment #6

- ☐ XBOX 360 Game-Play (5 minute quarters)
  - Games Statistics collected at end of each quarter.
- ☐ XBOX 360 Game Scenarios (6 different scenarios)
  - Play selection/Decision time recorded

#### Appointment #7

- ☐ XBOX 360 Game-Play (5 minute quarters)
  - Games Statistics collected at end of each quarter.
- ☐ XBOX 360 Game Scenarios (6 different scenarios)
  - Play selection/Decision time recorded
- ☐ Football Knowledge Test (50-item Multiple Choice Test)
- ☐ Video Game Play Survey

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## **INFORMED CONSENT DOCUMENT**

**Title of Study:** Use Of VIDEOGAMES To Increase Sport Knowledge And Game-Play Performance

**Investigators:** Mark Sanger, B.A.

This is a research study. Please take your time in deciding if you would like to participate. Please feel free to ask questions at any time.

### **INTRODUCTION**

The purpose of this study is to learn if video gaming (playing Madden '08 on XBOX 360) can improve a person's sport specific knowledge and decision-making. More specifically, can the use of this video game increase sport specific knowledge (football knowledge from pre to post intervention)? You are being invited to participate in this study because you reside in Central Iowa, are 18 years of age or older, have participated in the game of football, and have not coached football at the high school level or higher.

### **DESCRIPTION OF PROCEDURES**

If you agree to participate in this study, your participation will last for approximately 6-7 hours total over a period of no more than 3 weeks and will involve 7 visits to the Department of Kinesiology. Appointments will last approximately one hour. The first appointment may last longer than the others due to discussion and paperwork. During this study you may expect the following study procedures to be followed:

#### **Appointment #1**

1. Questionnaire (~10 minutes). Participants will be asked questions regarding their football playing and video game playing experience using a 10-item questionnaire. Other questions will relate to demographic information such as age, gender, size of high school (i.e., 1-A), football experience (years), football success (starter, letter winner, etc), and current level of participation in football. For the questionnaire portion of the study, you may skip any question that you do not wish to answer or that makes you feel uncomfortable.
2. Football Knowledge Test (~25-35 minutes). A 50-item multiple choice test will be taken to assess declarative and procedural knowledge of rules, positions, terminology, strategy, and scenarios specific to the sport of football. This test will be taken again after the intervention during appointment #7.
3. Practice (~15-20 min). After completing the questionnaire and the knowledge test, using a XBOX 360 gaming system, you will be given a 20 minute practice session (mini-games option) to familiarize yourself with player movement options for Madden '08, a realistic video football game.

#### **Appointment #2**

1. XBOX Game Play (~30-40 min). You will be asked to play Madden '08 on the XBOX 360 video gaming system, with game statistics recorded at the end of each quarter. A 40" LCD television will be used. You will use a researcher-selected team, and play one game against a computerized opponent of the same team (e.g., Chicago Bears vs. Chicago Bears) with a 5 minute quarter length. Researchers will handle all video game and television set-up prior to actual participant game play. This step will be

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followed exactly the same at each appointment (excluding appointment #1) for a total of 6 XBOX 360 game play sessions. We ask that you do not play XBOX 360 Madden '08 between now and your next appointment.

2. XBOX Game Scenarios (~10 min). After each game play session, you will be given 6 researcher controlled game-play scenarios (using XBOX system). All aspects of these 6 scenarios will be controlled by the researcher, and you are responsible for making the offensive play selection. The play selection is then recorded along with the time taken to make the decision. This step will be followed exactly the same at each appointment (excluding appointment #1) for a total of 6 sessions of XBOX 360 game play scenarios.

#### Appointment #3

1. XBOX Game Play (~30-40 min).
2. XBOX Game Scenarios (~10 min).

#### Appointment #4

1. XBOX Game Play (~30-40 min).
2. XBOX Game Scenarios (~10 min).

#### Appointment #5

1. XBOX Game Play (~30-40 min).
2. XBOX Game Scenarios (~10 min).

#### Appointment #6

1. XBOX Game Play (~30-40 min).
2. XBOX Game Scenarios (~10 min).

#### Appointment #7

1. XBOX Game Play (~30-40 min).
2. XBOX Game Scenarios (~10 min).
3. Football Knowledge Test (~25-35 min).
4. Video Game Play Survey (~5 min). Once the knowledge test is over, you will be given a survey regarding the amount of exposure to football and football video game play done outside the experiment. The questions will work to understand the amount of football related experiences outside that of the experiment (i.e. Football watched? studied? attended? etc.).

### RISKS

There are no foreseeable risks associated with this study.

### BENEFITS

If you decide to participate in this study there may be no direct benefit. The information gained in this study will benefit society by providing valuable information about the potential benefits (or lack thereof) of video gaming on sport knowledge and/or decision making and provide a foundation for the start of further intervention research using video games with in physical education or athletics.

### COSTS AND COMPENSATION



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You will not have any costs from participating in this study. You will not be compensated for participating in this study.

## **PARTICIPANT RIGHTS**

Your participation in this study is completely voluntary and you may refuse to participate or leave the study at any time. If you decide to not participate in the study or leave the study early, it will not result in any penalty or loss of benefits to which you are otherwise entitled.

## **CONFIDENTIALITY**

Records identifying participants will be kept confidential to the extent permitted by applicable laws and regulations and will not be made publicly available. However, federal government regulatory agencies, auditing departments of Iowa State University, and the Institutional Review Board (a committee that reviews and approves human subject research studies) may inspect and/or copy your records for quality assurance and data analysis. These records may contain private information.

To ensure confidentiality to the extent permitted by law, the following measures will be taken; participants will be assigned a unique code number that will be used on forms instead of their name. Only researchers will have access to participant records, which will be kept in a locked filing cabinet. Data will be retained for 3 years before destruction. If the results are published, your identity will remain confidential.

## **QUESTIONS OR PROBLEMS**

You are encouraged to ask questions at any time during this study.

- For further information about the study contact Mark Sanger, 515-294-3867. Advising faculty, Dr. Katherine Thomas, may also be contacted at 515-294-8677.
- If you have any questions about the rights of research subjects or research-related injury, please contact the IRB Administrator, (515) 294-4566, [IRB@iastate.edu](mailto:IRB@iastate.edu), or Director, (515) 294-3115, Office of Research Assurances, Iowa State University, Ames, Iowa 50011.

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### **PARTICIPANT SIGNATURE**

Your signature indicates that you voluntarily agree to participate in this study, that the study has been explained to you, that you have been given the time to read the document and that your questions have been satisfactorily answered. You will receive a copy of the written informed consent prior to your participation in the study.

Participant's Name (printed) \_\_\_\_\_

\_\_\_\_\_  
(Participant's Signature)

\_\_\_\_\_  
(Date)

### **INVESTIGATOR STATEMENT**

I certify that the participant has been given adequate time to read and learn about the study and all of their questions have been answered. It is my opinion that the participant understands the purpose, risks, benefits and the procedures that will be followed in this study and has voluntarily agreed to participate.

\_\_\_\_\_  
(Signature of Person Obtaining  
Informed Consent)

\_\_\_\_\_  
(Date)

**FOOTBALL AND XBOX 360  
EXPERIENCE QUESTIONNAIRE**

1. Date of Birth (month/date/year) \_\_\_\_\_

2. How would you describe your football participation history?

a. I have never played football [Skip to Question 6]

b. I have played football

3. Do you currently play in a competitive or recreational football league?

a. No

b. Yes

If yes, please name the type of setting (e.g. intramurals, club, YMCA, Collegiate)

\_\_\_\_\_

4. How many hours of football do you play per week?

a. Less than 1 hour

b. 1-3 hours

c. More than 3-5 hours

d. More than 5 hours

5. Which best describes the highest level of football you have competitively played? (Circle one)

a. Elementary football

b. Junior high/middle school football

c. 1 year of high school football or non-letter winner

d. 2-4 years of high school football or letter-winner

Class (e.g., 2-A) \_\_\_\_\_ State: \_\_\_\_\_

e. Collegiate football experience

Affiliation (e.g., NCAA D-I, NAIA, JUCO, etc.) \_\_\_\_\_

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6. Have you had any coaching experience in the game of football?

- a. No
- b. Yes

If yes, what level?

\_\_\_\_\_

7. Are you interested in coaching football?

- a. No
- b. Yes

8. Do you watch football? (circle one)

- a. No [Skip to Question 9]
- b. Yes

If yes, how do you watch football?

- i. Television
- ii. Attend Games
- iii. Both

If yes, how much football do you watch per week?

- i. less than 1 hour per week
- ii. 2-4 hours per week
- iii. more than 4 hours per week

If yes, during how many months of the year do you watch football?

- i. 1-3 months of the year
- ii. 3-6 months of the year
- iii. more than 6 months of the year

If yes, what level of football do you watch? (circle all that apply)

- i. NFL
- ii. College
- iii. High School
- iv. Other(s) \_\_\_\_\_

9. How would you describe your XBOX 360 playing history?

- a. Have never played (or played 1-2 times)
- b. Play occasionally (1-2 times per week)
- c. Play regularly (3 or more times per week)

10. Have you played Madden '08 Football on XBOX 360?

- a. No
- b. Yes

If yes, how much per week?

- i. less than 1 hour per week
- ii. 2-4 hours per week
- iii. more than 4 hours per week

11. How much time do you spend playing video games per week?

- a. Less than 1 hour
- b. 1-3 hours
- c. 3-5 hours
- d. More than 5 hours

## Cognitive Test: Football

### Rules/Field

1. What are the dimensions of a football field?
  - a. 120 x 53.3
  - b. 100 x 53.3
  - c. 120 x 50
  - d. 100 x 50
  
2. There are two sets of lines near the center of a football field that mark off 1-yard increments. These are referred to as:
  - a. Yard lines.
  - b. Hash marks.
  - c. Yard Stripes.
  - d. Numbers.
  
3. If a player receives a kick-off at his own 4-yard line and returns it 54 yards, at what yard line will the next play begin?
  - a. Opponent's 46.
  - b. Own 46.
  - c. Opponent's 42.
  - d. Opponent's 48.
  
4. What is it called when a defensive player enters into the neutral zone and makes contact with an opponent before the ball is snapped?
  - a. Off sides.
  - b. Encroachment.
  - c. False Start.
  - d. Jump Start.
  
5. On 3<sup>rd</sup> and 7 an offensive lineman is called for a false start. What is the down and distance for the next play?
  - a. 3<sup>rd</sup> and 7
  - b. 4<sup>th</sup> and 7
  - c. 3<sup>rd</sup> and 12
  - d. 4<sup>th</sup> and 10
  
6. How many players are on the football field during any given play?
  - a. 11
  - b. 20
  - c. 10
  - d. 22
  
7. What is the greatest number of points that can be scored in one play in a football game?
  - a. 3
  - b. 6
  - c. 7
  - d. 8

8. Which of the following is/are legal method(s) of scoring in a football game?
  - a. Extra point.
  - b. Field goal.
  - c. Drop kick
  - d. Both a and b.
  - e. All of the above.
9. If a team is down 8 points in a game, is it possible to tie the score with one possession? If so, how?
  - a. Yes, touchdown + two point conversion.
  - b. Yes, touchdown + extra point.
  - c. Yes, a field goal over 50 yards.
  - d. No.
10. If it is 4th & 6, how many yards does the offense have to gain to earn a first down?
  - a. 4
  - b. 12
  - c. 7
  - d. 6
11. What is it called when an offensive lineman is lined up in the neutral zone when the ball is snapped?
  - a. Off sides.
  - b. Encroachment.
  - c. False start.
  - d. Jump start.
12. On 1<sup>st</sup> and 10, a defensive player sacks that quarterback 6 yards behind the line of scrimmage. What is the new down and distance?
  - a. 2<sup>nd</sup> and 10
  - b. 2<sup>nd</sup> and 16
  - c. 2<sup>nd</sup> and 4
  - d. 1<sup>st</sup> and 10

#### Technique

13. What is the technique called when a defensive back is one-on-one versus an offensive receiver?
  - a. Zone coverage.
  - b. Man coverage.
  - c. Receiver coverage.
  - d. None of the above.
14. In a zone defense, what coverage area is usually the responsibility of an inside linebacker?
  - a. Flats.
  - b. Deep half.
  - c. Hook to curl.
  - d. Offensive backfield.
15. When a cover 2 defense is called, what kind of defense is this?
  - a. Man-to-man.
  - b. Prevent.
  - c. Zone.
  - d. Rush.

16. If a defensive call is cover 3, this means:
- a. There are 3 defensive backs.
  - b. There are 3 linebackers.
  - c. There is a 3 man pass rush.
  - d. There is a 3 deep zone coverage.

#### Strategy

17. What defensive coverage is better to defend against short passes?
- a. Cover 2
  - b. Cover 3
  - c. Cover 4
  - d. All work the same.
18. *Scenario:* You are playing a team that has a very fast and quick kickoff return man. What type of kick-offs can help minimize his success in the return game?
- a. Kicks to the deep middle of the field.
  - b. End over end kicks.
  - c. Squib kicks.
  - d. Kicks out of bounds.
19. If a defense is over pursuing to the football, what might be a good play to take advantage of this?
- a. A reverse.
  - b. Toss sweep.
  - c. Short pass.
  - d. None of the above.
20. What types of plays can an offense run to neutralize an aggressive style of defense?
- a. Deep passes.
  - b. Screens.
  - c. Draws.
  - d. Both b and c.
  - e. All of the above.
21. An offense is on their opponent's 20-yard line with 2 seconds to play in the game. The offense is down 2 points, what is the best play call?
- a. Screen pass.
  - b. Pass to the end zone.
  - c. Field goal attempt.
  - d. Flea Flicker.
22. After an offense scores a touchdown and kicks an extra point, they are down 3 points with 1 minute left and no timeouts. What is the next play call to give the offensive team the best shot at victory?
- a. A squib kick.
  - b. An onside kick.
  - c. A deep corner kick.
  - d. A kick out of bounds.
23. Of the following scenarios, which is the best time to call a punt block?
- a. Opponent is at midfield, 4<sup>th</sup> and 10.
  - b. Opponent is on your 40 yard line, 4<sup>th</sup> and 2.
  - c. Opponent is on own 2 yard line, 4<sup>th</sup> and 10.
  - d. No option is better than the others.



24. Which side of the ball is most important for a team's success?
- Offense.
  - Defense.
  - Special teams.
  - All are equally important.
25. The team on defense is winning by 6 points with 1 minute to play in the game, and the opposing team is on their own 20 yard line. Which defense(s) would be effective for this situation?
- Cover 3 with deep zones.
  - Prevent package.
  - Nickel Coverage.
  - All are sufficient coverages.
26. The team on offense is down 3 points in the second quarter. There is 7 seconds left in the quarter, the clock is stopped, and they have no timeouts. The ball is spotted on the opponent's 7 yard-line on 4<sup>th</sup> down. What is the best decision for the next play call?
- Field Goal.
  - Spike the ball.
  - Pass for the end zone.
  - Run
27. If a team chooses to kick off when they have won the toss to start the game, what typically is the strategy behind this decision?
- To take the wind.
  - Because they have a great defense.
  - They want to scout the opposing offense.
  - All of the above.

#### Scenarios

28. The offensive team faces a 4<sup>th</sup> and 5 on their own 45 yard line. There is 1:15 left in the second quarter, they have no time outs and they lead by 4 points. Choose the best play call for this situation.
- Pass.
  - Run
  - Punt.
  - Field goal.
29. A team is kicking off after scoring. They are winning by 4 points with 2:33 left in the 4<sup>th</sup> quarter. Each team has one time out left. What is the best choice for the kicking team?
- Deep kick middle.
  - Kick out of bounds.
  - Squib kick.
  - Onside kick.
30. Your team is down by 4 points with :17 seconds left in the game. The ball is on your opponent's 12 yard and you have one time out left. It is 4<sup>th</sup> and 1 yard to go, what is the best offensive choice?
- Field Goal.
  - Run.
  - Pass.
  - Fake Field Goal.

31. The offensive team faces a 3<sup>rd</sup> and 11 on their opponent's 32 yard line with :42 seconds left in the second quarter. They are down 10 points with two time outs left. What is the best choice for the next offensive play?
- Toss Sweep
  - Field Goal.
  - Quarterback draw.
  - Pass.
32. Your team is down 14-16 and has the ball your opponent's 15 yard line with :14 seconds left in the game. It is 4<sup>th</sup> and 10 with no timeouts. What is the best play call for the next play?
- Run.
  - Field Goal.
  - Pass.
  - Punt.
33. There is 8:23 left in the 3<sup>rd</sup> quarter and your team is down by 7 points. You have the ball on your opponent's 41 yard line and face a 3<sup>rd</sup> down and 1 yard to go with two timeouts. What is the best play call for this 3<sup>rd</sup> down play?
- Draw.
  - Long pass.
  - Quick Slant pass.
  - FB dive.
34. The score is tied with :03 seconds left in the first half. It is 4<sup>th</sup> down and goal to go on the opponent's 2 yard line with no timeouts. What is the best play call?
- Run.
  - Pass.
  - Field Goal.
  - Fake Field Goal.
35. After a touchdown the score is 17-20, the team kicking off is down by 3 points and has all three time outs. There is 1:59 left in the game, what is the best option?
- Onside kick.
  - Deep kick.
  - High, short kick.
  - Squib kick.
36. It is 4<sup>th</sup> and 3 on the opponent's 5 yard line with :24 seconds left in the game? The offensive team is down 6 points with one timeout left, what is the best offensive selection?
- Pass.
  - Run.
  - Field Goal.
  - Punt.
37. The score is 14-20 with 2:30 left in the 4<sup>th</sup> quarter and the ball is on the offense's own 49 yard line. It is 4<sup>th</sup> down and 5 yards to go and the offense has 3 timeouts left. What is the best option for the next play?
- Run.
  - Field Goal.
  - Pass.
  - Punt.

38. Your team is down 14-16 and has the ball your opponent's 15 yard line with :14 seconds left in the game. It is 4<sup>th</sup> and 10 with no timeouts. What is the best play call for the next play?

- a. Field Goal.
- b. Run.
- c. Pass.
- d. Punt.

39. You are down 3 points with :03 seconds left in the game and it is 3<sup>rd</sup> down and goal on the opponent's 2 yard line. You have no time outs, what is the best offensive selection?

- a. Pass.
- b. Punt.
- c. Field Goal.
- d. Run.

40. 1<sup>st</sup> and goal from the opponent's 3 yard line with 8:23 left in the 3<sup>rd</sup> quarter. The offensive team is down by 3 points and has 2 time outs left. What is the best offensive selection?

- a. Punt.
- b. Pass.
- c. Field Goal.
- d. Run.

41. With 1:38 left in the 4<sup>th</sup> quarter, your team is down by one point (20-21). You have one time out left and are kicking off to your opponent. What is the best option for this situation?

- a. Deep kick.
- b. Onside kick.
- c. Squib kick.
- d. Kick out of bounds.

42. Down 3 points, 4<sup>th</sup> and 3, ball on opponent's 47 yard line, 2:15 left in 2nd quarter with one time out, what is the best play call?

- a. Punt.
- b. Pass.
- c. Field Goal.
- d. Run.

43. You are behind one point with :05 seconds left in the game facing 4<sup>th</sup> down and goal on the opponent's 5 yard line. You have no time outs, what do you call for a play?

- a. Punt.
- b. Pass.
- c. Field Goal.
- d. Run.

44. With :45 seconds left in the 4<sup>th</sup> quarter, your team faces a 2<sup>nd</sup> and 17 and is down by 7 points with 2 time outs left. What is the best play call?

- a. Punt.
- b. Pass.
- c. Field Goal.
- d. Run.

45. With 1:01 left in the game, your team is down by 6 points with one time out left. It is 4<sup>th</sup> down and goal from the 7 yard line, what is the best play call for this situation?
- a. Pass.
  - b. Run.
  - c. Field Goal.
  - d. Punt.
46. The offense is down 7 points with 4:15 left in the second quarter and has one time out. It is 4<sup>th</sup> down and 5 yards to go on the opponent's 47 yard line. What is the best play selection?
- a. Punt.
  - b. Pass.
  - c. Field Goal.
  - d. Run.
47. It's 3<sup>rd</sup> and 1 from the opponent's 11 yard line with 5:55 left in the 3<sup>rd</sup> quarter. The offensive team is down 3 points and has two time outs left. What's the best play in this situation?
- a. Punt.
  - b. Pass.
  - c. Field Goal.
  - d. Run.
48. You are down by 7 points with :42 seconds left in the game. It is 3<sup>rd</sup> and 10 on your opponent's 42 yard line and you have 2 time outs left. What is the appropriate play call?
- a. Punt.
  - b. Pass.
  - c. Field Goal.
  - d. Run.
49. Your team is down 1 point with no time outs and :07 seconds left in the 4<sup>th</sup> quarter. It is 2<sup>nd</sup> and goal from the 9 yard line. What is the best play call?
- a. Punt.
  - b. Pass.
  - c. Field Goal.
  - d. Run.
50. Down 17 – 21 with :24 seconds left in the 4<sup>th</sup> quarter, your team faces a 3<sup>rd</sup> down and 1 yard from the opponent's 8 yard line. You have one time out left, what is the best play call?
- a. Punt.
  - b. Pass.
  - c. Field Goal.
  - d. Run.

# Data Collection Session 1

Category	Statistics			
	Q1	Q2	Q3	Q4
Score				
Total Offense				
Rushing				
Passing				
First Downs				
Punt Return Yards				
Kick Return Yards				
Total Yards				
Turnovers				
3rd Down Conv. (%)				
4th Down Conv. (%)				
2-Point Conv.				
Red Zone %				
# of TD				
# of FG				
Penalties				
Time of Possession				
Coin Toss				
# of Plays/Decisions				

Session 1 Scenarios	Punt	Kickoff	Run	Pass	Field Goal	Clock
Play Selection						
Reaction Time						

- Session 1

Punt

Kickoff

Run

Pass

Field Goal

Gray
- Session 2

Pass

Punt

Field Goal

Run

Gray

Kickoff
- Session 3

Kickoff

Gray

Punt

Field Goal

Pass

Run
- Session 4

Gray

Run

Pass

Punt

Kickoff

Field Goal
- Session 5

Run

Field Goal

Gray

Kickoff

Punt

Pass
- Session 6

Field Goal

Pass

Kickoff

Gray

Run

Punt

**Post Test**  
**Football Exposure Survey**

1. Have you attended a football game since the beginning of this study?

If yes, how many? \_\_\_\_\_

2. Have you read about or studied football since you started this study? **(Describe)**

3. Have you watched football on TV?

If yes, how many hours total? \_\_\_\_\_

4. Have you played Madden 2008 during this study other than as part of the intervention?

5. Are you still interested in coaching football?

6. What best describes your ability to coach football?

- a. Less confident than before playing Madden '08 for 3 weeks.
- b. Same as before playing Madden '08 for 3 weeks.
- c. More confident than before playing Madden '08 for 3 weeks.

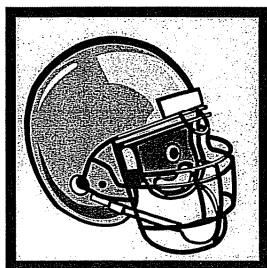
**Explain**

ISU IRB # 1	08-441
Approved Date:	13 November 2008
Expiration Date:	12 November 2009
Initial by:	jlc

ISU IRB # 1	08-441
Approved Date:	13 November 2008
Expiration Date:	12 November 2009
Initial by:	jc

# PARTICIPANTS NEEDED

to play XBOX 360!!



## USE OF VIDEO GAMES TO INCREASE SPORT KNOWLEDGE AND GAME-PLAY PERFORMANCE?

We are looking for male volunteers, age 18-25 of ALL football and video game backgrounds.  
(Played Football But Never Coached!)



360

**At the Forker Building (Iowa State University Campus), participants will be asked to:**

- ✓ *Complete a questionnaire*
- ✓ *Take a football knowledge test*
- ✓ *Play Madden '08 on XBOX 360*
- ✓ *Take a Survey*

**It will be fun!**

**Total time commitment is approximately 7 hours  
(7 x 1-hour sessions at your convenience)**

**Contact: Mark Sanger**  
**515-294-2928**  
***masanger@iastate.edu***

**Department of Kinesiology, Iowa State University**

1-1

Time	1:15	Possession
Home	21	Guest
0		18
T.O.L.		T.O.L.
DOWN	TO GO	QTR.
4	5	2
		BALL ON
		OWN
		45



Time		Possession	
Home	28	Guest	24
1	T.O.L.	1	T.O.L.
DOWN	TO GO	BALL ON	QTR.
-	-	--	4

Time	00:17		
Home	17	Possession	Guest
			21
1	T.O.L.		1
DOWN	TO GO	BALL ON	QTR.
4	1	12	4

Time

00:42

Home

7

Guest

17

Possession

2

T.O.L.

1

T.O.L.

DOWN

3

TO GO

11

BALL ON

32

QTR.

2

OPPONENT'S


32

1-5

Time	00:14	Possession	
Home	14		Guest
0	T.O.L.	1	T.O.L.
DOWN	TO GO	BALL ON	QTR.
4	10	15	4



Time			
Home	8:23	Guest	
14	Possession	21	
2	T.O.L.	3	T.O.L.
DOWN	TO GO	BALL ON	QTR.
3	1	41	3

Time	
Home	Guest
7	14
Possession	
	
T.O.L.	T.O.L.
2	1
DOWN	QTR.
TO GO	BALL ON
2	4
17	47

2-2

Time		Possession	
Home	2:30	Guest	21
0		1	
T.O.L.		T.O.L.	
DOWN	TO GO	BALL ON	QTR.
4	3	40	2

2-3

Time	00:22	Possession	
Home	13		Guest
0	T.O.L.	1	T.O.L.
DOWN	TO GO	BALL ON	QTR.
4	9	9	4




Time		8:23		Possession		Guest		10	
Home	7								
T.O.L.		T.O.L.		T.O.L.		T.O.L.		T.O.L.	
2		3		3		3		3	
DOWN		TO GO		BALL ON		QTR.		3	
1		3		3		3		3	

2-5

Time		00:03	
Home	7	Possession	Guest
7	0	1	7
T.O.L.	T.O.L.	T.O.L.	T.O.L.
DOWN	TO GO	BALL ON	QTR.
4	2	2	2

Time	
Home	Guest
20	21
Possession	
1	1
T.O.L.	T.O.L.
DOWN	QTR.
TO GO	
OPONENT'S	
BALL ON	
-	--
--	4

Time	
Home	Guest
27	28
Possession	
	
2	2
T.O.L.	T.O.L.
DOWN	QTR.
TO GO	
OPONENT'S	
BALL ON	
-	--
--	4



Time		1:59	
Home	17	Possession	Guest
3		20	
T.O.L.	1	T.O.L.	4
DOWN	TO GO	BALL ON	QTR.
-	--	--	4

Time			
Home	2:15	Guest	21
18	Possession	1	1
		T.O.L.	T.O.L.
DOWN	TO GO	BALL ON	QTR.
4	3	47	2

Time		Possession	
Home	20	Guest	21
0	T.O.L.	1	T.O.L.
DOWN	TO GO	BALL ON	QTR.
4	5	5	4

Time

00:42

Home

7

Guest

15

Possession

2

T.O.L.

1

T.O.L.

DOWN

3

TO GO

12

BALL ON

30

OPPONENT'S

4

QTR.



Time	00:24	
Home	17	Possession
Guest	21	
1	T.O.L.	1
DOWN	TO GO	BALL ON
3	1	8
		4
		QTR.

Time	00:24	Possession	
Home	8	Guest	14
1	T.O.L.	1	T.O.L.
DOWN	TO GO	BALL ON	QTR.
4	3	5	4

Time		00:31	
Home	17	Possession	Guest
20		20	
T.O.L.		T.O.L.	
1		1	
BALL ON		QTR.	
TO GO		4	
DOWN		15	
3		1	

Time	1:01	Guest	14
Home	8	Possession	
1	T.O.L.	1	T.O.L.
DOWN	TO GO	BALL ON	QTR.
4	7	7	4



4-4

Time		4:15	
Home	14	Possession	Guest
1	T.O.L.	1	T.O.L.
DOWN	TO GO	BALL ON	QTR.
4	5	47	2
1		21	

Time	6:27	Possession	
Home	21		
Guest	24		
1	T.O.L.	BALL ON	QTR.
2	T.O.L.	TO GO	4
		DOWN	--
			--
			-

Time	00:07	
Home	7	Possession
Guest	8	
	0	1
T.O.L.		T.O.L.
DOWN	TO GO	BALL ON
2	9	9
		QTR.
		4

Time		5:55	
Home	7	Possession	Guest
7		10	
2		3	
T.O.L.		T.O.L.	
DOWN		QTR.	
TO GO		BALL ON	
3		11	
1		3	
OPONENT'S			



Time		Possession	
Home	Guest		
7	8		
0	1	T.O.L.	T.O.L.
DOWN	BALL ON	TO GO	QTR.
3	10	3	4

5-3

Time		Possession	
Home	2:30	Guest	20
14		2	
3		T.O.L.	
		BALL ON	QTR.
		OWN	
		TO GO	4
		DOWN	49
			5
			4

Time		Possession	
Home	26	Guest	28
2		1	
T.O.L.		T.O.L.	
DOWN	TO GO	BALL ON	QTR.
-	--	OPPONENT'S	4

Time	
Home	Guest
0	0
Possession	
3	3
T.O.L.	T.O.L.
DOWN	QTR.
4	1
TO GO	BALL ON
2	OWN
25	



Time	00:42	Possession	
Home	7	T.O.L.	2
Guest	14	T.O.L.	1
		BALL ON	
		TO GO	10
		DOWN	3
		OPPONENT'S	42
		QTR.	4

Time		Possession	
Home	00:14	Guest	
14		16	
0		1	
T.O.L.		T.O.L.	
DOWN	TO GO	BALL ON	QTR.
4	10	15	4

6-2

Time		Possession	
Home	7	Guest	17
T.O.L.		T.O.L.	
2	1	QTR.	
BALL ON		2	
TO GO		32	
DOWN	11	3	

Time		Possession	
Home	28	Guest	24
1	T.O.L.	1	T.O.L.
DOWN	TO GO	BALL ON	QTR.
-	-	--	4



Home	Guest
17	20
T.O.L.	T.O.L.
0	1
DOWN	QTR.
3	4
TO GO	BALL ON
2	OPPONENT'S
2	
Time	Possession
00:03	

Time		00:17		Possession			
Home	17	Guest	21				
1	T.O.L.	1	T.O.L.				
DOWN	4	TO GO	1	BALL ON	12	QTR.	4

Time		Possession	
Home	1:15	Guest	18
21		1	
T.O.L.		T.O.L.	
0		QTR.	2
DOWN	TO GO	BALL ON	OWN
4	5	45	